

XIX. *Notes on the Life History of Trochilium andrenæforme*, Lasp. By the Hon. N. CHARLES ROTHSCHILD, M.A., F.L.S. *With notes on the larva* by EUSTACE R. BANKES, M.A., F.L.S., *and on the pupa* by T. A. CHAPMAN, M.D., F.L.S.

[Read November 21st, 1906.]

### PLATE XXVIII.

IN this year's "Entomologist's Monthly Magazine," Ser. II, vol. xvii, p. 160,\* I have already recorded the fact of the breeding of *Trochilium andrenæforme* from larvæ collected in Great Britain.

In the late summer of 1898 Mr. Sydney Webb of Dover suggested to the present writer that a search for the larva of this rare insect in the stems of *Viburnum lantana* might possibly prove successful. Mr. Sydney Webb had found an empty pupa-case protruding from the stem of this plant, and as the case in question undoubtedly belonged to a Sesiid he came to the conclusion that it could be none other than the present species.

It appears, however, that the food plant of this moth was already known at that time, though it was not until August of this year that the writer, on reading Max Bartel's† book was made aware of this fact, and apparently the record has been generally overlooked. As stated by Max-Bartel,‡ Mr. Heinrich Neustetter found in July 1896 two freshly emerged specimens of this moth at rest on the stem of a Guelder-rose from which the empty pupa-cases were protruding, in a garden at Bleiberg, in Austria.§

\* "E. M. M., 2nd Series, vol. xvii, p. 160, 1906.

† Die palaearktischen Gross-schmetterlinge und ihre Naturgeschichte, vol. ii, p. 334, 1902.

‡ Bartel's reference to Neustetter's paper is misleading, as the page quoted is that of the separatum and not of the journal.

§ Beitrag zu Macrolepidopteren—Fauna von Kärnthen von Heinrich Neustetter X. Jahresbericht des Wiener Entomologischen Vereines, 1899, p. 38. Wien 1900.

All the larvæ that I have examined were secured in stems of the Wayfaring tree, *Viburnum lantana*, but the above-mentioned record would lead one to suppose that the species mines both in *Viburnum lantana* and in *V. opulus*. The first larva that I found was mining in a bush of *V. lantana* at the edge of the author's garden at Ashton Wold, Oundle, Northamptonshire, in November 1905. This specimen duly emerged as a fine female on the 12th June this year. During a walk in Surrey in the winter of 1905 I was surprised to see in a hedge several old mines of this species, but owing to a lack of time was unfortunately prevented from re-visiting the spot. At the author's request Mr. H. McArthur went there in the following spring and secured two larvæ in the same hedge, which never emerged. The author found a mined stem, this time containing a pupa or full-fed larva, in another part of Surrey in 1906, which, as previously recorded, emerged on the 10th June, this specimen being a male. Mr. H. McArthur then visited another locality in Kent, and there was successful in securing several larvæ and pupæ, two of which, a male and a female, emerged on the 2nd and 6th July respectively. Some of these larvæ are still feeding at the time this article goes to press, and others produced ichneumons. The author found two more larvæ, both of which unfortunately died, in Huntingdonshire, and numerous old mines in Kent. The description of the larva, presumably about two-thirds grown, and of the empty pupa-case (for which I am indebted to Mr. Eustace Bankes and Dr. T. A. Chapman), are appended to this article. The peculiarity of the present species is that the mine is unlike that of any other Sesiid with which I am acquainted, and to exhibit these peculiarities, photographs on Plate XXVIII have been taken. The empty mine of the insect in question is most characteristic and cannot, we fancy, be mistaken for anything else, see Plate XXVIII, fig. 2. It will be noticed from an examination of the photographs that the insect in question makes one straight mine in the centre of the twig or bough. One of the stems we have measures nearly two inches in diameter, while another is half an inch across or less. An opening from the mine to the outside of the bough (the opening from which the larval frass exudes and the insect emerges) is almost at right angles to the mine.

The larva of *Trochilium andrenæforme*, unlike that of

most Sesiids, does not prepare a spot in the mine from which the imago emerges. The perfect insect on the contrary, as already stated, emerges from the only hole in the mine, from which the larval frass was also previously ejected. Some of the specimens cover the opening over with a cap consisting of a thin piece of bark quite separate from the rest of the twig, which apparently remains on until the insect emerges. The mine exhibiting this peculiarity, Fig. 4, contained a living pupa which was unfortunately cut through. Other mines lack the cap and have the characteristic appearance shown in Fig. 2, and in these cases the cap has obviously been dislodged. Other mines, again, have an irregular piece of bark gnawed right out, leaving the hole exposed, through which the frass of the living larva protrudes. In such cases as these one would imagine that the larva had failed to make a cap. The construction of this cap appears to us to be difficult of explanation, and it is hoped that some other entomologist will solve the difficulty. One specimen which we had in the breeding cage crawled out of the twig, re-entered it, and bored a hole through the bark, but not into the wood underneath it, and excavated a circular spot between the bark and the wood in which it lay concealed.\* Figs. 5 and 6 represent mined twigs from which ichneumons emerged. These have been identified by Mr. Claude Morley as *Meniscus agnatus*, Grav. *Demopheles caliginosus*, Grav., also identified by Mr. Claude Morley, emerged from another mine.

While the present article was in the press I found several mines of this species at Tring, in Hertfordshire, in *Viburnum lantana*, and one old mine (undoubtedly belonging to this species) in *Viburnum opulus*.

\* The mine of this specimen also contained the pupa of a Coleopteron.

*Notes on the larva of Trochilium andrenæforme, Lasp.*  
By EUSTACE R. BANKES, M.A., F.E.S.

ON July 26th last I received, through the generosity of the Hon. N. Charles Rothschild, a portion of a stem of *Viburnum lantana* that he knew, by deduction, must contain a feeding larva of the extremely rare *Trochilium andrenæforme*. As Mr. Rothschild had informed me that, although it was certain that some of the very few larvæ he had obtained had made external journeys along the stems, he had not succeeded in catching sight of any of them, and, to the best of my belief, no human eye had ever rested on the insect in this stage, it was with all the more intense satisfaction that, at 7 a.m. on July 28th, I found my larva on the outside of the stem, near the top of it. Thinking that it might prefer a fresh-cut piece of stem, I started off in search of a suitable one, leaving it where it was, and it then proceeded to gnaw an excavation in the bark, and to build a circular, blister-like, chamber over itself, composed of fragments of bark and gnawed wood, woven together with white silk. The small size of the chamber, of which the diameter was only 6.5 mm., did not nearly admit of its owner lying stretched in a straight line therein, and, during the whole course of operations, extending over some hours, the latter had to maintain a curled or contorted attitude, though its truly marvellous flexibility enabled it to reverse its position, or to assume any one that might be necessary. I was not free to describe the larva until about 3 p.m., by which hour it had apparently completed its chamber—which was soft to the touch and projected noticeably above the surface of the surrounding bark—and was entirely concealed therein. In order to extract the larva for examination, it was necessary to break open its chamber, of which the walls had been finished first, the centre of the somewhat arched roof being the last portion to be filled in, and the occupant was then found busily engaged in boring into the solid wood of the stem. It is clear, therefore, that the chamber is constructed in order to conceal and protect the larva

until it has been able to excavate a burrow, sufficiently large to receive it, in the wood itself, and it subsequently serves the further useful purpose of concealing and protecting from enemies the mouth of its burrow.

The following is the description that I made of the larva:—

*Length*, when moderately stretched, 11 mm. *Greatest breadth* (*i. e.* across prothorax) 1.75 mm. *Head* broad, rather flattened, highly polished, brownish-ochreous, clouded on the sides with tawny-brown, partially retractile into the prothorax; upper mouth-parts mostly blackish; ocelli minute, black, well separated. *Prothorax* of great breadth (the broadest part of the whole larva), with a large, highly-polished, almost transparent, watery-whitish-ochreous, undivided plate, through which the posterior portion of the head, when retracted, is clearly seen. *Meso- and meta-thorax* rather narrower than prothorax, and somewhat broader than abdomen. The *thorax* and *abdomen* together form a mass which tapers gradually from its anterior to its posterior extremity, and shows very clearly-defined segmental divisions; in colour it is semitransparent watery-ochreous-whitish, with the pulsating dorsal vessel showing through as a broad (zigzag, in reality, and of varying width), deep purplish-brown, mediodorsal line. *Skin* not glossy, smooth, but with various transverse wrinkles, each segment being divided into three distinct subsegments, the larva being thus enabled to contort itself to an extent almost past belief. There is a well-developed lateral flange below the spiracles. *Anal plate* polished, semitransparent, watery-ochreous-whitish, the dark contents of the *cloaca* being clearly visible through it. *Tubercles* of moderate size, polished, concolorous with ground-colour, each emitting a single short hair. *Spiracles* small, watery-whitish, with ochreous centres. *Hairs* few, short, single, scattered, pale brown. *Legs* highly polished, whitish-ochreous externally, paler internally; claws dusky-brown. *Prolegs* semitransparent watery-ochreous-whitish, with dark brown terminations.

I inadvertently omitted to note down details about the *ventral surface*, but feel sure that it was concolorous with the dorsum. In colour, undulating constrictions on being touched, etc., this larva is decidedly maggot-like, though by no means so in shape when extended. Its movements are deliberate, and its rate of progression is remarkably slow.

At 3.45 p.m. the larva was placed on a crack in the bark of the fresh-cut stem of *Viburnum lantana*, and, ensconcing itself therein, it forthwith proceeded to build

over itself another chamber, similar in construction to the previous one, only longer and much narrower, its breadth being made to coincide with that of the crack in the bark. By 11 p.m. the indefatigable subject of these notes had nearly completed its temporary domicile, and was almost concealed from view, though it could be seen, through the diminishing gap in the roof, to be still hard at work thereon. This chamber, which appeared quite finished by 7 a.m. on the following day (July 29th), and probably had been so for several hours, was elliptical in shape, 9 mm. long, by 3 mm. wide across the middle, and became covered externally with numerous frass-like pellets (mostly reddish-brown, though some were quite ochreous) of gnawed inner bark and wood, mixed with frass, which seems to vary in colour from reddish-brown to blackish-brown. The larva continued to feed in this same burrow, at any rate for the next two or three weeks, as was evidenced by the frass and pellets, which continued to be extruded through some invisible opening in the walls of the chamber, the pellets that could not adhere to these falling on the sand at the bottom of the cage. But, at some time between the middle of August and the latter part of October, it clearly left this burrow, wandered a few inches down the stem, constructed an elliptical-oval, blister-like, chamber (about 10 mm. long, by 5.5 mm. wide across the middle) over itself between the two *Viburnum* stems just where they closely approached one another, its base being fixed to one stem and its roof to the bark of the other, and bored thence into the solid wood, in which it still (November 7th) remains lost to view.

It seems obvious that the larva of *T. andrenæforme* feeds throughout one year and through portions of two others, that is, for the greater part of two years, for there can be but little doubt that the individual under notice, which must have been deposited as an egg about mid-summer 1905, hatched out within the next month or two, and that it will not be full-fed before the spring of next year (1907).

Notes on the pupa of *Trochilium andrenæformis*, Lasp.\*

By T. A. CHAPMAN, M.D., F.E.S.

PUPA of *Tr. andreniformis* from an empty case (♀). Of the usual *Ægeriad* structure. Belongs to the genus *Trochilium*. The genera known to me may be divided as follows:—

*Ægeria* (*erabroniformis* = *bembeciforme*), has spines along front row of second abdominal segment, and five spines on each side of crown on tenth abdominal segment, the two dorsal ones (four altogether) very small.

*Sciapteron* (*tabaniforme* = *vespiforme*), has no spines on second segment (abdominal), on each side five nearly equal to crown on tenth.

*Bembecia* (*hylaciformis*), first and second abdominal segments very smooth, only one or two large spines on ninth abdominal (all the other genera have more or less of a row in both sexes, *hylaciformis* only in ♂), has six spines on each side of crown on tenth.

*Trochilium* has only four spines on each side in the crown on tenth segment. The first abdominal has no spines, the second varies in the different species (or individuals?).

In *asiliforme* (= *cynipiforme*) and *chrysidiforme* there are present spines of both the anterior and posterior row.

In *scoliæforme* and *formicæforme* the spines are present in the front row, the back row being represented by a line.

The majority of the genus have faint spines on the front row and no very definite indication of the posterior, the surface being smooth and no line easily made out.

In *andreniformis* we have the extreme of this section, the front line has but faint elevations to mark some only of the spines, though the bases of those that are absent are rather more chitinized than the rest of the line, and there is a line showing the position of the posterior row. This is no doubt correlated with its being perhaps the palest (least chitinized) of all the species.

\* Laspeyres wrote *andrenæformis*; it is a pity that this does not agree with *Trochilium*. I have not verified the names of other species referred to. T. A. C.

In common with the whole group, *Trochilium* has the appendages fixed to first and second abdominal segments, and also almost as firmly to third; but this connection dissolves on deliiscence and the suture 1-2 abdominal also opens. Segments 3, 4, 5 and 6 (abdominal) carry two (an anterior and posterior) rows of spines directed backwards, 7 also does so in the ♂; in the ♀ like 8 and 9 it only has the forward row. These spines are stronger on each segment than on the preceding one.

Specific characters are probably confined to the relative strengths and extensions of these rows, to the development of the nose-horn (beak) and to the exact details of the spines on anal segments, possibly also to the forms of the spines. Even so, it seems difficult to be sure in any case how far the variations observed are specific and how far individual.

*Spheciiforme*, *scoliaforme* and *culiciforme* differ slightly in build, the others taper regularly (or nearly so); these taper much more in the last few segments.

*Andreniformis* differs in the spines in all the rows being finer, smaller and paler than in the other species examined, just as the pupa itself is so, though probably the paleness of the spines affords a good part of the impression that the pupa as a whole is pale.

The nose-horn (beak) is in accord with the general weak structure in being very small and short, a mere fine nodule on the face, that one almost overlooks—it is nevertheless sharp. (In many species this is large, sharp and formidable.)

The above memoranda seemed necessary in order to define its generic and subgeneric position, and if possible to suggest points by which it might be distinguished from most nearly allied species. The individual variations are however so considerable and the distinction so slight, that I doubt whether any species of *Trochilium* could be named with certainty from its pupa. Having only one example of *andreniformis*, its range of variation cannot be estimated, and it is therefore so far fortunate that its general more delicate structure gives some points of difference with the other species examined. The following description is largely generic, or even family, rather than specific. The arrangement of the terminal crown of spines differs somewhat in most species.

The pupa-shell is 19 mm. long, the segments are extended and the shell curved, it might be 20 mm. if straight, 16 mm. with the segments contracted. The width is about 3 mm. from front of mesothorax to fourth or fifth abdominal segment, thence it tapers regularly to about 1.1 mm. at crown in tenth segment.

The maxillæ extend down to 7.5 mm. from front and include basally a lozenge of labrum (palpi) of 1 mm. long, divided by a median line. The wings and second legs reach 0.5 mm. further (to 8.0 mm. from front), and the third legs extend by themselves 1 mm. beyond this to 9.0 mm., *i. e.* as far as fifth abdominal segment, but the flattening of abdominal ventral aspect shows that in some attitudes it would reach to quite end of sixth. The first femur is quite a large piece nearly 2.0 mm. long between the maxillæ and the first leg (tibia) which reaches about 1.5 mm. further, these abut forwards against the eye-pieces and the maxillary palpus, which stretches inwards here from the antennæ, and almost shut out the second leg. The maxillary palpus is a transverse slip about 0.4 mm. long, about 0.12 mm. wide against antennæ narrowing inwards; it has a raised sutural margin and has transverse lines of fine points.

The labrum is pointed below and is very large in so far that it is not well marked off from the face and so reaches up to the beak; the mandibles are comparatively narrow slips, meeting each other in the middle line by their pointed extremities. The beak is a minute sharp point in the middle of the projecting and rounded front. The antennæ reach down to the same length as the maxillæ. In this dehisced specimen they are of course out of their grooves and in fact twisted away backwards, as often takes place in these *Trochilia*. There is a pair of hairs on the labrum (lower part of face), another pair above, and a hair at the base of each antennæ, about 0.12 mm. long.

The antennal segments are distinctly marked off. The maxillæ also have many transverse markings like fine dotted wrinkles. Poulton's line is well marked, the portion beyond it at the apex being about 0.3 mm. long. The hind-wing is about 0.4 mm. broad at its base, and continues slightly narrowing for nearly 2 mm., then does so more thoroughly, but leaves a fine margin all along round to the apex of fore-wing or nearly so. The dorsal head-piece is nearly 0.5 mm. wide (on either side, 1.0 mm. right across), about 0.25 mm. longitudinally in middle line, pointed laterally. It has, like the prothorax, and the front of the mesothorax, a much raised sutural border, and has a ridge across it marking off the outer angle. The prothorax is similar in form, each side 1.0 mm. wide and 0.4 mm. long medially. The mesothorax is 2.6 mm. long with a central raised suture and a groove with raised inner margin extending back

from its front margin, marking off the wing base (or patagium?). It points to, but does not (by 0.7 mm.) reach the notch formed by the forward lateral extension of the metathorax, each half is about 1.2 mm. wide, 0.4 mm. long in middle line, 1.0 mm. at lateral forward extension. These portions of the thorax are smooth, with very minute tessellations. One minute hair is detected on mesothorax perhaps 0.05 mm. long—there are probably others.

The first abdominal segment is about 0.6 mm. wide (1.0 mm., with intersegmental membrane, after dehiscence). It has no marks, spines or processes, it probably has a hair or two, but they are not detected. The second abdominal segment is 1.3 mm. wide (with intersegmental membrane). Its spiracle lies in a hollow at its front outer angle, the hind-wing is slightly waved to make room for it, and there is a walled ridge round it internally and behind. Right across the front of the segment is a dark line in which it is just possible to believe one sees small elevations of obsolete spines, the more as their places are marked by dark lines radiating into the general surface; posteriorly, is a just discernible line. Each side carries three hairs (about 0.1 mm. long), one below and behind spiracle in the hollow with it, one just above inner front margin of hollow (III ?), and one nearer the middle line, a little behind spine ridge (I ?). The third abdominal segment is larger than the second. The spiracle is on the smooth surface, both lines have spines well developed, the upper one reaches almost as far out as spiracle, the posterior rather less. On the next (fourth) segment the front row goes ten spines ventral of spiracle, the posterior much as on third. On the fifth the front line reaches for about twelve spines ventral of spiracle, the posterior much the same as previous segment. On these the front row comes to margin of lateral flange, on sixth it goes well on to it, as also on seventh. On eighth it is only just below spiracular level and on ninth a little lower. The posterior row on 6 is much as on fifth. No trace of it on 7, 8 or 9 (probably like other species it exists on seventh in ♂). On third to ninth segments the dorsal hairs (I and III ?) exist, getting on fifth very close to the row of spines and on the following ones almost on it. On third and fourth segments is a hair below the spiracle and on fifth, sixth and seventh are two hairs in this position, one directly above the other and close to each other and to the spiracle. No other hairs are found (except on tenth abdominal). The spines get larger on the later segments, but are much the same on 7, 8 and 9. On 9 there are about eleven spines on either side, with a dorsal vacancy of the width of three or four spines. On the fifth segment the front row has eighty-two spines. The larger posterior ones are wider and stronger than those in front, but not much longer, the longest about

0.1 mm. and about half their length wide at base (those in front two-fifths). The length of the base is nearly the same as the height of the spine ; the form of the spines is much that of a rose-thorn but straighter and thicker, the front sloping backwards in a straight line, the back hollowed in a curve, but vertical to the surface of origin. The general surface is smooth, but very minutely tessellated like the thorax. The last (tenth abdominal) segment is not very definitely marked off ventrally from eighth and ninth. The curvature of the pupa and especially of this segment makes its termination rather ventral than posterior. It has a ring of eight strong spines round its margin, almost equally spaced, except that the space between the two ventral ones (3 and 4) on each side is rather less than the others. Each of these is about 0.1 mm. high, but stands on a little eminence making it twice as tall. All face to the centre of the segment, round which they form as it were the spikes of a crown ; each rises outside by a convex slope, on the inner side the face is a hollow, with a ridged margin ; it terminates in a neck rather bent inwards, the end being the base of a hair, which in each case points to the centre of the segment. The hair is about 0.1 mm. long. Looking from behind or rather from below to the centre of the ring formed by these spines, the space is occupied by a rounded swelling, higher above (posteriorly), where it is rather full and rounded (the obsolete cremastral spike). The front half has the longitudinal anal scar with some lateral parallel ridges and some radiating wrinkles into the boss behind. The whole width of the ninth segment has a longitudinal ventral suture a little widened against eighth. The eighth has an obscure ventral flattened smooth space notched at each margin, but with little trace of line or pore.

In dehiscence the fracture is down the median dorsal line through dorsal head-piece and through the whole thorax. The front head-piece separates from these and the antennæ lift out clear ; the head-piece is held in place by the maxilla, whose extremities remain *in situ*, and by mere shreds connecting it with the first femora and legs ; the femora separate except at their extremities being held to the tibia at one end and to the head (*prosternum* really) at the other. The eye-piece separates and forms a last element of a chain held together by membrane of mesothorax, pronotum, and dorsal head-piece. Essentially nothing is ruptured except the dorsal suture, and the dorsal from the ventral head-covering ; though also no doubt much sternal delicate membrane interiorly suffers.

EXPLANATION OF PLATE XXVIII.

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- FIG. 1. Mine with empty pupa-case protruding. Imago ♀ emerged July 6th, 1906.
2. The same with pupa-case removed.
  3. Mine with pupa-case removed. Imago ♂ emerged July 2nd, 1906.
  4. Mine showing "cap" *in situ*. The living pupa was accidentally cut through.
  5. Mine from which the ichneumon *Meniscus agnatus*, Grav., emerged.
  6. Vertical section of entire mine from which the Ichneumon *Meniscus agnatus*, Grav., emerged.